Accelnet™ Micro Panel

DIGITAL SERVOAMPLIFIER
for BRUSHLESS or BRUSH MOTORS

Control Modes
- Indexer, Point-to-Point, PVT
- Camming, Gearing, Position, Velocity, Torque

Command Interface
- CANopen/DeviceNet
- ASCII and discrete I/O
- Stepper commands
- ±10V position/velocity/torque command
- PWM velocity/torque command
- Master encoder (Gearing/Camming)

Communications
- CANopen/DeviceNet
- RS232

Feedback
- Digital Quad A/B encoder
- Secondary encoder / emulated encoder out
- Digital Halls

I/O - Digital
- 9 inputs, 4 outputs

Dimensions: mm [in]
- 97 x 63 x 33 [3.8 x 2.5 x 1.3]

Model	Ip	Ic	Vdc
ACJ-055-09	9	3	55
ACJ-055-18	18	6	55
ACJ-090-03	3	1	90
ACJ-090-09	9	3	90
ACJ-090-12	12	6	90

DESCRIPTION

Accelnet Micro Panel is a compact, DC powered servo drive for position, velocity, and torque control of AC brushless and DC brush motors. It can operate on a distributed control network, as a stand-alone indexing drive, or with external motion controllers.

Indexing mode enables simplified operation with PLC's which use outputs to select and launch indexes and inputs to read back amplifier status. Additionally, a PLC can send ASCII data that can change motion profiles so that one index can perform various motions as machine requirements change. DeviceNet capability enables multiple *Accelnet* drives to be controlled from PLC's that use this communication protocol.

The CANopen distributed control architecture is also supported. As a CAN node operating under the CANopen protocol, it supports Profile Position, Profile Velocity, Profile Torque, Interpolated Position, and Homing. Up to 127 drives can operate on a single CAN bus and groups of drives can be linked via the CAN so that they execute motion profiles together.

Operation with external motion controllers is possible in torque (current), velocity, and position modes. Input command signals can be ±10V (torque, velocity, position), PWM/Polarity (torque, velocity), or stepper format (CU/CD or Step/Direction).

GENERAL SPECIFICATIONS

Test conditions: Load = Wye connected load: 2 mH + 2 Ω line-line. Ambient temperature = 25°C, +HV = HV_{max}

MODEL	ACJ-055-09	ACJ-055-18	ACJ-090-03	ACJ-090-09	ACJ-90-12	
OUTPUT POWER						
Peak Current	9 (6.36)	18 (12.73)	3 (2.12)	9 (6.36)	12 (8.5)	Adc (Arms, sinusoidal), ±5%
Peak time	1	1	1	1	1	Sec
Continuous current	3 (2.12)	6 (4.24)	1 (0.71)	3 (2.12)	6 (4.24)	Adc (Arms, sinusoidal), ±5%
Peak Output Power	490	970	270	800	1600	W
Continuous " "	163	323	89	267	533	W
Output resistance	0.075	0.075	0.075	0.036	0.075	Rout (Ω)
Maximum Output Voltage	Vout = HV*0.97 - Rout*Iout					
INPUT POWER						
HV_{min} to HV_{max}	+20 to +55	+20 to +55	+20 to +90	+20 to +90	+20 to +90	Vdc, Transformer-isolated
Ipeak	9	18	3	9	12	Adc (1 sec) peak
Icont	3	6	1	3	6	Adc continuous
Aux HV	+20 to +HVmax @ 500 mAdc maximum					
PWM OUTPUTS						
Type	3-phase MOSFET inverter, 15 kHz center-weighted PWM, space-vector modulation					
PWM ripple frequency	30 kHz					

DIGITAL CONTROL		
Digital Control Loops	Current, velocity, position. 100% digital loop control Dual loop position control using secondary encoder input	
Sampling rate (time)	Current loop: 15 kHz (66.7 us) Velocity, position loops: 3 kHz (333 us)	
Commutation	Sinusoidal field-oriented control or trapezoidal from Halls for brushless motors	
Modulation	Center-weighted PWM with space-vector modulation	
Bandwidths	Current loop: 2.5 kHz typical, bandwidth will vary with tuning & load inductance	
HV Compensation	Changes in bus voltage do not affect bandwidth	
Minimum load inductance	200 µH line-line	
COMMAND INPUTS		
CANopen	Profile Position, Interpolated Position, Profile Velocity, Profile Torque, Homing	
Digital position	Step/Direction, CW/CCW	Stepper commands (2 MHz maximum rate)
	Quad A/B Encoder	20 Mcount/sec (after quadrature), 5 Mline/sec
Digital torque & velocity	PWM , Polarity	PWM = 0~100%, Polarity = 1/0
	PWM	PWM = 50% ±50%, no polarity signal required
	PWM frequency range	1 kHz minimum, 100 kHz maximum
	PWM minimum pulse width	220 ns
Analog torque/velocity/position	±10 Vdc, 5 kΩ differential input impedance	
DIGITAL INPUTS		
Number, type	9, non-isolated. [IN1] dedicated to Amp Enable function, [IN2]~[IN9] are programmable	
All inputs	74HC14 Schmitt trigger operating from +5 Vdc with RC filter on input 10 kΩ to +5 Vdc or ground for all except [IN5] (see below)	
Logic levels	Vin-LO < 1.35 Vdc, Vin-HI >3.65 Vdc, Input voltage range 0 to +24 Vdc	
Pull-up, pull-down control	All inputs have group selectable connection of input pull-up/down resistor to +5 Vdc, or ground	
Enable [IN1]	1 Dedicated input with 330 µs RC filter for amplifier enable	
GP [IN2,3,4]	3 General Purpose inputs with 330 µs RC filter	
MS [IN5]	1 Medium-Speed input for motor temperature switch, 33 µs RC filter, 4.99 kΩ pullup/pulldown	
HS [IN6,7,8,9]	4 High-Speed Inputs inputs with 100 ns RC filter	
DIGITAL OUTPUTS (NOTE 1)		
Number, type	4, non-isolated, programmable	
[OUT1~4]	Current-sinking MOSFET with 1 kΩ pullup to +5 Vdc through diode	
Current rating	100 mAdc max, +30 Vdc max. Functions programmable External flyback diode required if driving inductive loads	

MULTI-MODE ENCODER PORT	
Operation	Motor encoder signals are buffered and appear on J5 for feedback to control system Programmable to be quadrature encoder input for electronic gearing
Signals	A, /A, B, /B, X, /X
Receiver	26C32 differential line receiver (for operation as an encoder input port)
Driver	26C31 differential line driver (for operation as buffered encoder outputs)
Frequency	20 MHz (post-quadrature)
RS-232 PORT	
Signals	RxD, TxD, Gnd
Mode	Full-duplex, serial communication port for amplifier setup and control, 9,600 to 115,200 baud
Protocol	Binary or ASCII formats
CAN PORTS	
Signals	CANH, CANL, Gnd
Isolation	CAN interface circuit and +5 Vdc supply for CAN is optically isolated from amplifier circuits
Format	CAN V2.0b physical layer for high-speed connections compliant
Data	CANopen Device Profile DSP-402
Address selection	Programmable to flash memory or determined by digital inputs
MOTOR CONNECTIONS	
Phase U, V, W	PWM outputs to 3-ph. ungrounded Wye or delta wound brushless motors, or DC brush motors
Hall U, V, W	Digital Hall signals, single-ended
Encoder A, /A, B, /B, (X,/X)	Digital quadrature encoder signals, differential (X or Index signal not required) 5 MHz maximum line frequency (20 Mcounts/sec) 26C32 differential line receiver with 121 Ω terminating resistor between complementary inputs
Hall & encoder power	+5 Vdc ±2% @ 250 mAdc max
Motemp [IN 5]	Motor overtemperature sensor switch input Programmable to disable amplifier when motor over-temperature condition occurs
Brake	[OUT1~4] are programmable for motor brake function, external flyback diode required
STATUS INDICATORS	
Amp Status	Bicolor LED, amplifier status indicated by color, and blinking or non-blinking condition
CAN Status	Bicolor LED, status of CAN bus indicated by color and blink codes to CAN Indicator Specification 303-3
PROTECTIONS	
HV Overvoltage	+HV > HV_{max}, Amplifier outputs turn off until +HV < HV_{max} (See Input Power for HV)
HV Undervoltage	+HV < +14 Vdc, Amplifier outputs turn off until +HV > +14 Vdc
Amplifier over temperature	Heat plate > 70°C
Short circuits	Output to output, output to ground, internal PWM bridge faults
I^2T Current limiting	Programmable: continuous current, peak current, peak time
Motor over temperature	Digital inputs programmable to detect motor temperature switch
Functions	Fault conditions are programmable as latching or non-latching types
MECHANICAL & ENVIRONMENTAL	
Size	3.83 x 2.47 x 1.29 in. (97.28 x 62.74 x 32.77 mm)
Weight	4.8 oz, 0.14 kg
Ambient temperature	0 to +45 °C operating, -40 to +85 °C storage
Humidity	0 to 95%, non-condensing
Contaminants	Pollution degree 2
Environment	IEC68-2: 1990
Cooling	Conduction through heatplate on amplifier chassis, or convection

CME 2™ SOFTWARE

Amplifier setup is fast and easy using CME 2™ software which communicates with the amplifier over CAN or an RS-232 link. All of the operations needed to configure the amplifier are accessible through this powerful and intuitive program. Auto-phasing of brushless motor Hall sensors and phase wires eliminates "wire and try". Connections are made once and CME 2™ does the rest thereafter. Encoder wire swapping to establish the direction of positive motion is eliminated.

Motor data can be saved as .ccm files. Amplifier data is saved as .ccx files that contain all amplifier settings plus motor data. This eases system management as files can be cross-referenced to ampifiers. Once an amplifier configuration has been completed systems can be replicated easily with the same setup and performance.

RS-232 COMMUNICATIONS

The serial-port is three-wire (RxD,TxD, Gnd), full-duplex RS-232 that operates from 9600 to 115,200 Baud. Connections to the RS-232 port are through J5, the Signal connector. The *Accelnet Micro Panel* Serial Cable Kit (ACJ-SK) contains a 9-pin female Sub-D serial port (COM1, COM2, etc.) connector and 2m (6 ft.) cable that is terminated in a J5 cable connector. This provides an easy connection to the amplifier for set-up without wiring to J5.

AMP STATUS LED

A bi-color LED gives the status of the amplifier by changing color, and either blinking or remaining solid. The possible color and blink combinations are:

- *Green/Solid*: Amplifier OK and enabled. Will run in response to reference inputs or CANopen commands.
- *Green/Slow-Blinking*: Amplifier OK but NOT-enabled. Will run when enabled.
- *Green/Fast-Blinking*: Positive or Negative limit switch active. Amplifier will only move in direction not inhibited by limit switch.
- *Red/Solid*: Transient fault condition. Amplifier will resume operation when fault is removed.
- *Red/Blinking*: Latching fault. Operation will not resume until amp is Reset

Fault conditions:

- Over or under-voltage
- Motor over-temperature
- Phasing error (current position is > 60° electrical from Hall angle)
- Short-circuits from output to output
- Short-circuits from output to ground
- Internal short circuits
- Amplifier over-temperature
- Position-mode following error

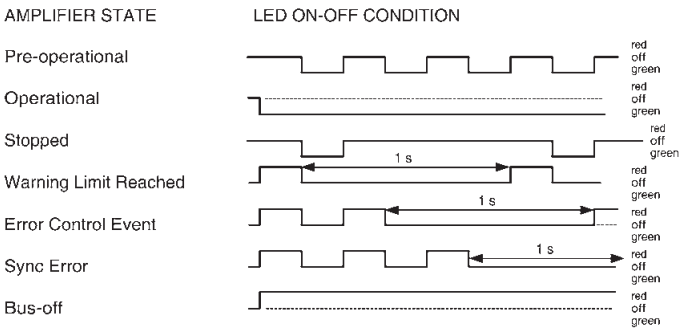
Faults are programmable to be either transient or latching

CANOPEN NETWORKING

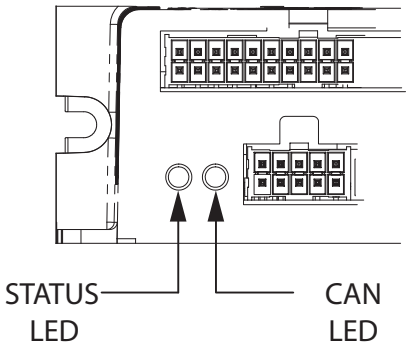
Based on the CAN V2.0b physical layer, a robust, two-wire communication bus originally designed for automotive use where low-cost and noise-immunity are essential, CANopen adds support for motion-control devices and command synchronization. The result is a highly effective combination of data-rate and low cost for multi-axis motion control systems. Device synchronization enables multiple axes to coordinate moves as if they were driven from a single control card.

CAN STATUS LED

The CAN status LED operates in accordance with CAN specification 303-3. This is a bi-color LED that uses red and green colors in solid, flashing, and blinking states to indicate conditions on the CAN bus.



STATUS LEDS



COMMAND INPUTS IN STAND-ALONE MODE

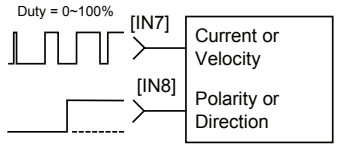
The command inputs control the amplifier to produce an output and are used when the amplifier is taking current, velocity, or position commands from an external controller in stand-alone mode. The command inputs take digital and analog signals in a variety of formats:

- Current or Velocity Mode
  - ±10V Analog
  - PWM/Direction
  - PWM 50%
- Position Mode
  - CU/CD
  - Step/Direction
  - ±10V Analog
- Master Encoder
  - A/B Quadrature

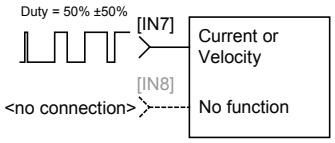
For current or velocity control, the PWM/Direction format takes a PWM signal at constant frequency which changes its' duty cycle from 0 to 100% to control current or velocity and a DC level at the Direction input to control polarity. The PWM 50% format takes a single PWM signal that produces 0 output at 50% duty cycle, and maximum positive/negative outputs at 0% or 100%. As a protection against wiring faults, the 0% and 100% inputs can be programmed to produce 0 output. When this is done the max/min duty cycle range is >0% and <100%.

CURRENT OR VELOCITY MODE REFERENCE INPUTS

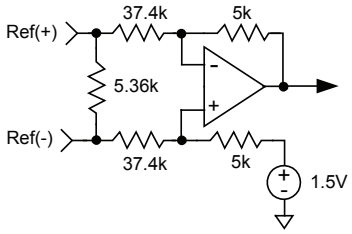
PWM/DIRECTION INPUTS



PWM 50% INPUT

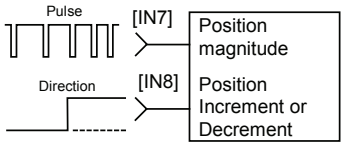


±10 V ANALOG INPUT

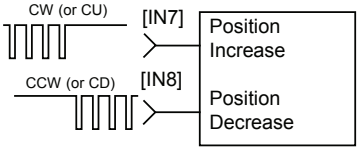


STEP MOTOR EMULATION INPUTS

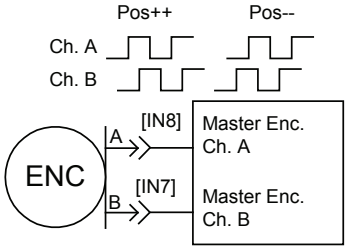
PULSE/DIRECTION INPUTS



COUNT-UP/COUNT-DOWN INPUTS



QUAD AB ENCODER



Position-control inputs take signals in popular stepper-motor format or from a digital quadrature encoder. The CU/CD format moves the motor in a positive direction for each pulse received at the count-up input. Negative motion is produced by pulses on the count-down input. The step-direction mode moves the motor an increment of position for every pulse received at the pulse input while the direction of movement is controlled by a DC level on the direction input.

Master encoder quadrature signals (A,B) are decoded into four counts per encoder line with the direction derived from the logic-state transitions of the inputs. In position mode the ratio of motor motion per input-count is programmable.

A ±10V analog command can control current, velocity, or position as well.

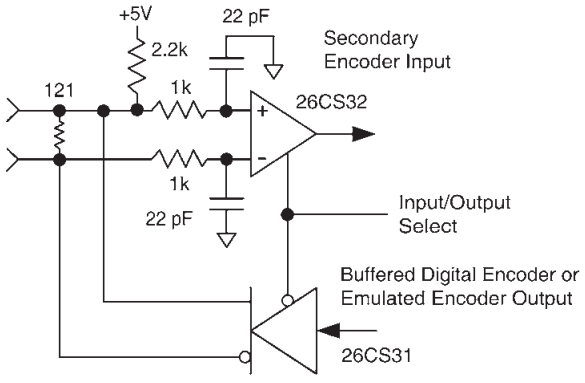
MULTI-MODE ENCODER PORT

This port consists of three differential input/output channels with functions programmable.

For dual-loop position-mode operation that employs a primary encoder on the motor, and a secondary encoder on the load, the port works as an input receiving the secondary encoder's quad A/B/X signals.

For stand-alone operation with an external motion controller, the signals from the digital encoder on the motor are buffered and made available at the control signal connector for transmission to the controller. This eliminates split-wired motor cables with dual connectors that take the encoder signals to both amplifier and controller.

FUNCTIONAL DIAGRAM OF ONE CHANNEL



DIGITAL INPUTS

Accelnet Micro Panel has nine digital inputs, eight of which have programmable functions. Input [IN1] is not programmable and is dedicated to the amplifier Enable function. This is done to prevent accidental programming of the input in such a way that the controller could not shut it down.

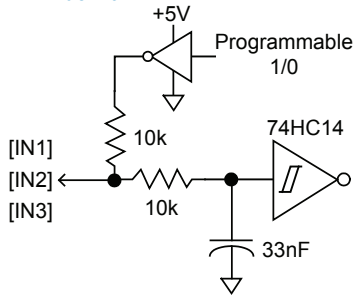
Two types of RC filters are used: GP (general purpose) and HS (high speed). Input functions such as Step/Direction, CU/CD, Quad A/B are wired to inputs having the HS filters, and inputs with the GP filters are used for general purpose logic functions, limit switches, and the motor temperature sensor. Programmable functions of the digital inputs include :

- Positive Limit switch
- Negative Limit switch
- Home switch
- Amplifier Reset
- PWM current or velocity commands
- CAN address bits
- Step & Direction, or CU/CD step motor position commands
- Quad A/B master encoder position commands
- Motor over-temperature

In addition to the active level and function for each programmable input, the input resistors are programmable in three groups to either pull up to +5 Vdc, or down to ground. Grounded inputs with HI active levels interface to PLC's that have PNP outputs that source current from +24 Vdc sources. Inputs pulled up to +5 Vdc work with open-collector, or NPN drivers that sink current to ground.

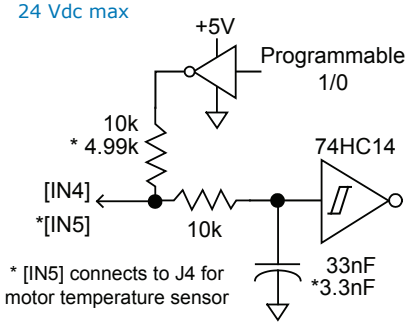
GP INPUTS 1,2,3

24 Vdc max



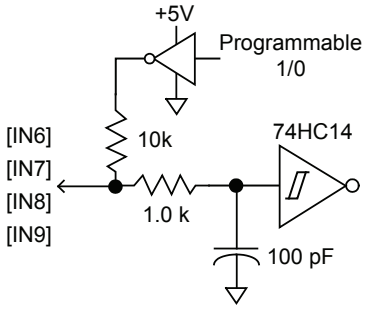
GP INPUTS 4,5

24 Vdc max



HS INPUTS 6,7,8,9

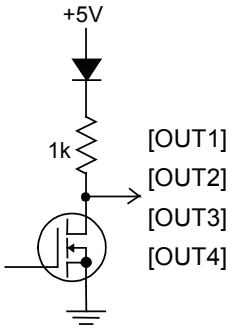
5 Vdc max



DIGITAL OUTPUTS

Digital outputs are open-drain MOSFETs with 1 kΩ pull-up resistors to +5 Vdc. These can sink up to 100 mAdc from external loads operating from power supplies to +30 Vdc. When driving inductive loads such as a motor brake, an external fly-back diode is required. The diode in the output is for driving PLC inputs that are opto-isolated and connected to +24 Vdc. The diode prevents conduction from +24 Vdc through the 1 kΩ resistor to +5 Vdc in the amplifier. This could turn the input on, giving a false indication of the amplifier output state.

These outputs are programmable to be on or off when active. Typical functions are amplifier fault indication or motor brake operation. Other functions are programmable.

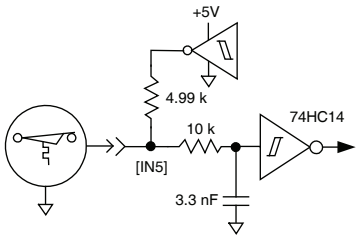


MOTOR CONNECTIONS

Motor connections are of four types: phase, Halls, encoder and thermal sensor. The phase connections carry the amplifier output currents that drive the motor to produce motion. The Hall signals are three digital signals that give absolute position feedback within an electrical commutation cycle. The encoder signals give incremental position feedback and are used for velocity and position modes, as well as sinusoidal commutation. A thermal sensor that indicates motor overtemperature is used to shut down the amplifier to protect the motor.

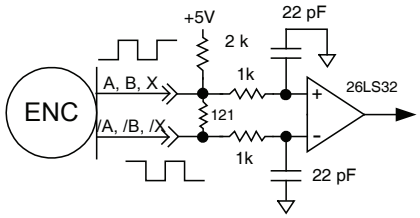
MOTOR TEMPERATURE SENSOR

Digital input [IN5] is for use with a motor overtemperature switch. The input should be programmed as a pull-up to +5 Vdc if the motor switch is grounded when cold, and open or high-impedance when over-heating.



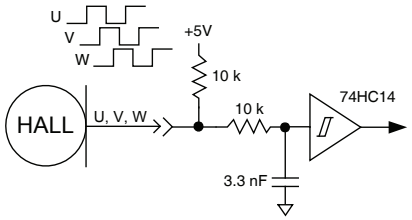
MOTOR ENCODER

The input circuit for the motor encoder signals is a differential line-receiver with R-C filtering on the inputs. A 121 Ω resistor is across each input pair to terminate the signal pairs in the cable characteristic impedance. The circuit is shown below. Encoders with differential outputs are required because they are less susceptible to noise that can be picked on single-ended outputs. For best results, encoder cabling should use twisted pair cable with one pair for each of the encoder outputs: A-/A, B-/B, and X-/X. Shielded twisted-pair is even better for noise rejection.



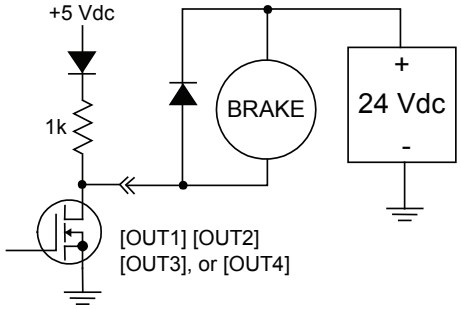
MOTOR HALL SIGNALS

Hall signals are single-ended signals that provide absolute feedback within one electrical cycle of the motor. There are three of them (U, V, & W) and they may be sourced by magnetic sensors in the motor, or by encoders that have Hall tracks as part of the encoder disc. They typically operate at much lower frequencies than the motor encoder signals, and are used for commutation-initialization after startup, and for checking the motor phasing after the amplifer has switched to sinusoidal commutation.



MOTOR BRAKE

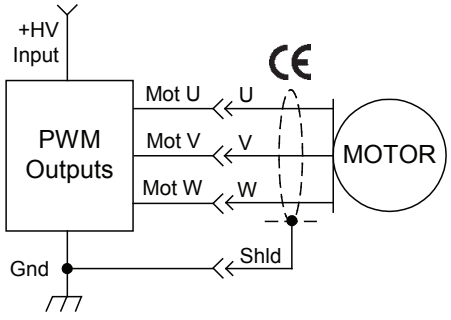
Digital outputs [OUT1,2,3,4] can be programmed to power a motor-mounted brake. These brake the motor when they are in an unpowered state and must have power applied to release. This provides a fail-safe function that prevents motor motion if the system is in an unpowered (uncontrolled) state. Because brakes are inductive loads, an external flyback diode must be used to control the coil voltage when power is removed. The timing of the brake is programmable.



MOTOR PHASE CONNECTIONS

The amplifier output is a three-phase PWM inverter that converts the DC buss voltage (+HV) into three sinusoidal voltage waveforms that drive the motor phase-coils. Cable should be sized for the continuous current rating of the amplifier. Motor cabling should use twisted, shielded conductors for CE compliance, and to minimize PWM noise coupling into other circuits. The motor cable shield should connect to motor frame and the amplifier frame ground terminal (J2-1) for best results.

CE = Shielded cables required for CE compliance



GROUNDING CONSIDERATIONS

Power and control circuits share a common circuit-ground (HV Gnd on J3-4, and Signal Ground on J2-5, J4-6 & 11, J5-2,9,15,17, and 28). Input logic circuits are referenced to Signal Ground, as are analog Reference inputs, digital outputs, encoder and Hall signals. For this reason, amplifier Gnd terminals should connect to the users' ground system so that signals between amplifier and controller are at the same common potential, and to minimize noise. The system ground should, in turn, connect to an earthing conductor at some point so that the whole system is referenced to "earth". The CAN ports are optically isolated from the amplifier circuits.

Because current flow through conductors produces voltage-drops across them, it is best to connect the amplifier HV Return to system earth, or circuit-common through the shortest path, and to leave the power-supply floating. In this way, the power supply (-) terminal connects to ground at the amplifier HV Return terminals, but the voltage drops across the cables will not appear at the amplifier ground, but at the power supply negative terminal where they will have less effect.

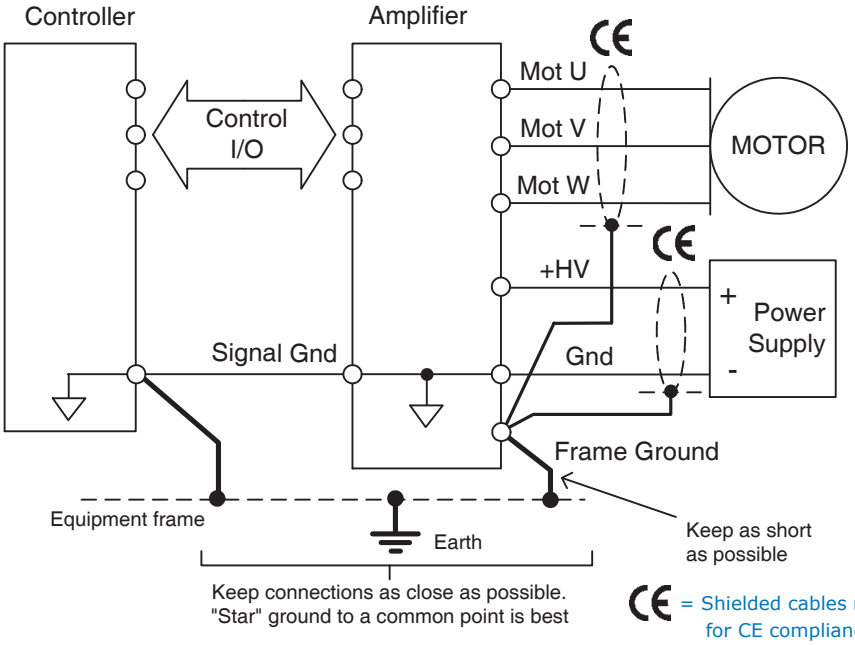
Motor phase currents are balanced, but currents can flow between the PWM outputs, and the motor cable shield. To minimize the effects of these currents on nearby circuits, the cable shield should connect to Gnd (J2-5).

The amplifier heatplate does not connect to any amplifier circuits. Cables must be shielded for CE compliance, and the shields should connect to the Frame Ground terminals. When installed, the amplifier heatplate should connect to the system chassis. This maximizes the shielding effect, and provides a path to ground for noise currents that may occur in the cable shields.

Signals from controller to amplifier are referenced to +5 Vdc, and other power supplies in user equipment. These power supplies should also connect to system ground and earth at some point so that they are at same potential as the amplifier circuits.

The final configuration should embody three current-carrying loops. First, the power supply currents flowing into and out of the amplifier at the +HV and Gnd pins on J3. Second the amplifier outputs driving currents into and out of the motor phases, and motor shield currents circulating between the U, V, and W outputs and Gnd. And, lastly, logic and signal currents connected to the amplifier control inputs and outputs.

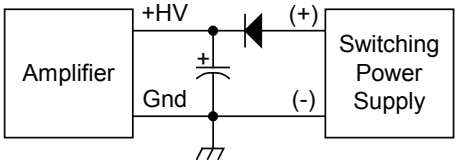
For CE compliance and operator safety, the amplifier should be earthed by using external tooth lockwashers under the mounting screws. These will make contact with the aluminum heatplate to connect it to the equipment frame ground.



POWER SUPPLIES

Accelnet Micro Panel operates typically from transformer-isolated, unregulated DC power supplies. These should be sized such that the maximum output voltage under high-line and no-load conditions does not exceed the amplifiers maximum voltage rating. Power supply rating depends on the power delivered to the load by the amplifier. In many cases, the continuous power output of the amplifier is considerably higher than the actual power required by an incremental motion application.

Operation from regulated switching power supplies is possible if a diode is placed between the power supply and amplifier to prevent regenerative energy from reaching the output of the supply. If this is done, there must be external capacitance between the diode and amplifier. Distance between this capacitor and the amplifier should be 1 metre or less.



AUXILIARY HV POWER

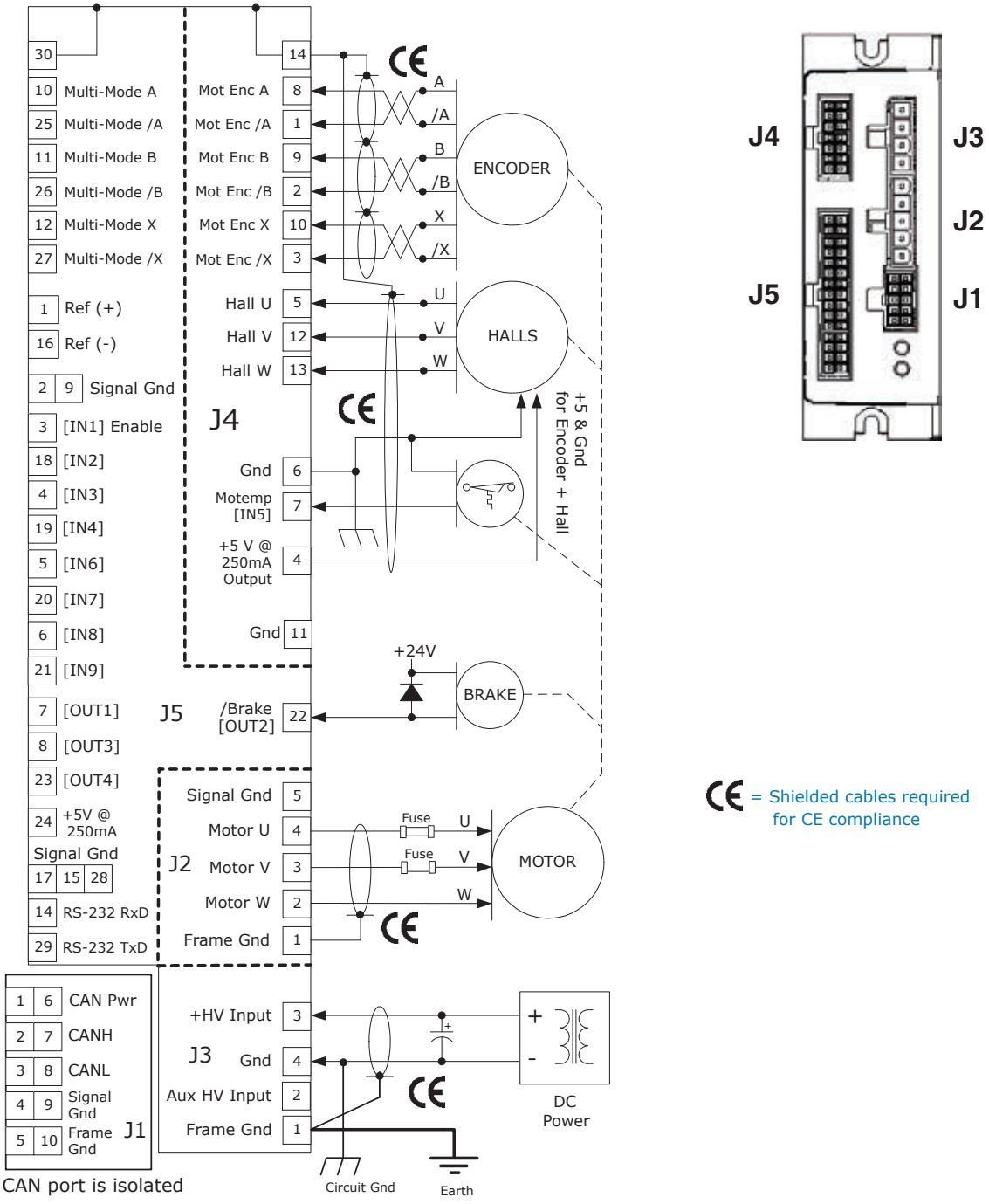
Accelnet Micro Panel has an input for AUX HV. This is a voltage that can keep the amplifier communications and feedback circuits active when the PWM output stage has been disabled by removing the main +HV supply. This can occur during EMO (Emergency Off) conditions where the +HV supply must be removed from the amplifier and powered-down to ensure operator safety. The AUX HV input operates from any DC voltage that is within the operating voltage range of the amplifier and powers the DC/DC converter that supplies operating voltages to the amplifier DSP and control circuits.

When the amplifier +HV voltage is greater than the AUX-HV voltage it will power the DC/DC converter. Under these conditions the AUX-HV input will draw no current.

MOUNTING & COOLING

Accelnet Micro Panel has slots for mounting to panels at 0° or 90°. Cooling is by conduction from amplifier heatplate to mounting surface, or by convection to ambient.

AMPLIFIER CONNECTIONS



= Shielded cables required for CE compliance

NOTES

1. The functions of input signals on J4-7 and J5-3,4,5,6,18,19,20, and 21 are programmable.
2. The function of [IN1] on J5-3 is always Amplifier Enable and is not programmable. The active level of [IN1] is programmable, and resetting the amplifier with changes on the enable input is programmable.
3. Pins J4-4 and J5-24 connect to the same +5 Vdc @ 250 mAdc power source. Total current drawn from both pins cannot exceed 250 mAdc.
4. Pins 5 & 10 of CAN port on J1 connect to frame ground for cable shield. All other CAN port pins are isolated from amplifier circuits.

CONNECTORS & SIGNALS

Conductor ratings for contacts (when used with crimping tools shown below):
Samtec CC79L-2024-01-F: AWG 24~20 wire, insulation diameter .035" (0,89mm) - .070" (1,78mm)
Molex 39-00-0039: AWG 24~18 wire, insulation diameter .051" (1.30mm) - .122" (3.10mm)

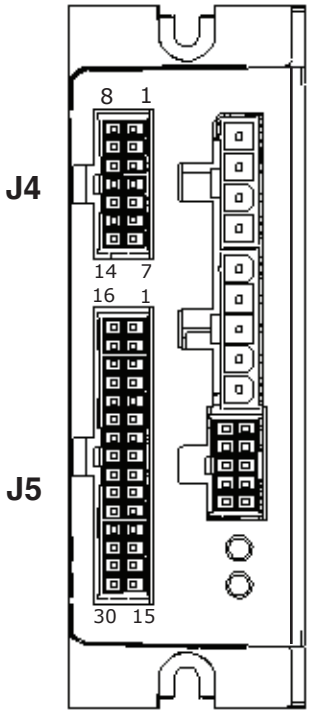
J4 Cable Connector:
14-position poke/crimp
Housing: Samtec IPD1-07-D
Contacts(14): Samtec CC79L-2024-01-F
Crimping tool: Samtec CAT-HT-179-2024-01
Contact Extractor: Samtec CAT-EX-179-01

J4 Feedback			
Signal	Pin		Signal
Encoder A	8	1	Encoder /A
Encoder B	9	2	Encoder /B
Encoder X	10	3	Encoder /X
Signal Ground	11	4	Encoder +5 Vdc
Hall V	12	5	Hall U
Hall W	13	6	Signal Ground
Frame Ground	14	7	Motemp [IN5]

J5 Signal			
Signal	Pin		Signal
Analog Ref (-)	16	1	Analog Ref (+)
Signal Ground	17	2	Signal Ground
Programmable Input [IN2]	18	3	Enable Input [IN1]
Programmable Input [IN4]	19	4	Programmable Input [IN3]
Programmable Input [IN7]	20	5	Programmable Input [IN6]
Programmable Input [IN9]	21	6	Programmable Input [IN8]
Programmable Output [OUT2]	22	7	Programmable Output [OUT1]
Programmable Output [OUT4]	23	8	Programmable Output [OUT3]
Encoder +5 Vdc	24	9	Signal Ground
Multi-Mode Encoder /A	25	10	Multi-Mode Encoder A
Multi-Mode Encoder /B	26	11	Multi-Mode Encoder B
Multi-Mode Encoder /X	27	12	Multi-Mode Encoder X
Signal Ground	28	13	Signal Ground
RS-232 TxD	29	14	RS-232 RxD
Frame Ground	30	15	Signal Ground

J5 Cable Connector:
30-position poke/crimp
Housing: Samtec IPD1-15-D
Contacts(30): Samtec CC79L-2024-01-F
Crimping tool: Samtec CAT-HT-179-2024-01
Contact Extractor: Samtec CAT-EX-179-01

J3 Cable Connector:
4-position poke/crimp
Housing: Molex 39-01-4041
Contacts: Molex 39-00-0039
Crimping Tool: Molex 11-01-0197
Extractor Tool: Molex 11-03-0044



J3 Power	
Pin	Signal
1	Frame Ground
2	Aux HV
3	+HV
4	HV Ground

J2 Motor	
Pin	Signal
1	Frame Ground
2	Motor W
3	Motor V
4	Motor U
5	Signal Ground

J2 Cable Connector:
5-position poke/crimp
Housing: Molex 39-01-4051
Contact: Molex 39-00-0039
Crimping Tool: Molex 11-01-0197
Extractor Tool: Molex 11-03-0044

CAN circuits are isolated from amplifier circuits

J1 CAN			
Signal	Pin		Signal
CAN Power	6	1	CAN Power
CANH	7	2	CANH
CANL	8	3	CANL
Signal Ground	9	4	Signal Ground
Frame Ground	10	5	Frame Ground

J1 Cable Connector:
10-position poke/crimp
Housing: Samtec IPD1-05-D
Contacts(10): Samtec CC79L-2024-01-F
Crimping tool: Samtec CAT-HT-179-2024-01
Contact Extractor: Samtec CAT-EX-179-01

ACJ-FC-10 FEEDBACK CABLE ASSEMBLY

Color	Pin		Color
Red	8	1	Black
White	9	2	Black
Green	10	3	Black
Blue	11	4	Black
Brown	12	5	Black
Yellow	13	6	Black
Orange	14	7	Black

This cable plugs into amplifier J4 and consists of seven twisted-pairs of AWG 24 wire. Each pair has a black and colored conductor. The chart above shows twisted-pairs in the rows. E.g. one pair goes to pins 1&8, another pair to pins 2&9, etc. Cable termination is flying leads for connection to customer motor feedback encoder.

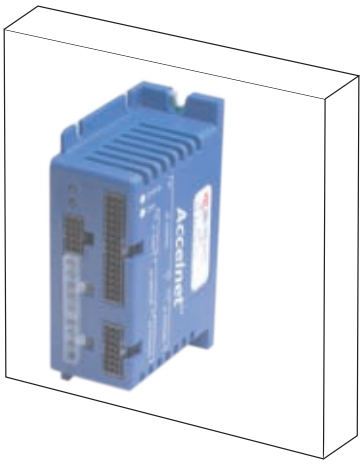
ACJ-NC-10 & ACJ-NC-01 CANOPEN CABLE ASSEMBLIES

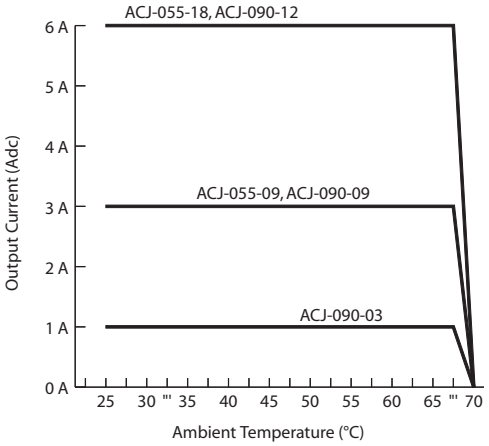
Color	Pin		Color
N/C	6	1	N/C
N/C	7	2	White/Orange
N/C	8	3	Orange
N/C	9	4	White/Green
N/C	10	5	N/C

These cables connect to amplifier J1 and have 3 conductors of AWG 24 wire that are terminated in contacts that can then be inserted into pins 7~9 of another ACJ-NC-10 to "daisy chain" the CAN signals to multiple amplifiers.

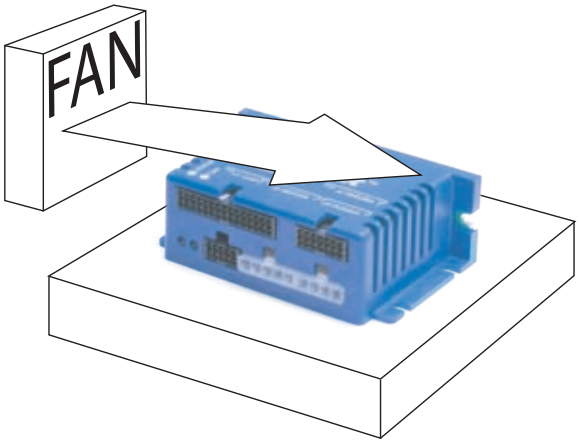
MOUNTING AND COOLING: CONTINUOUS OUTPUT CURRENT VS. MOUNTING AND AMBIENT TEMPERATURE

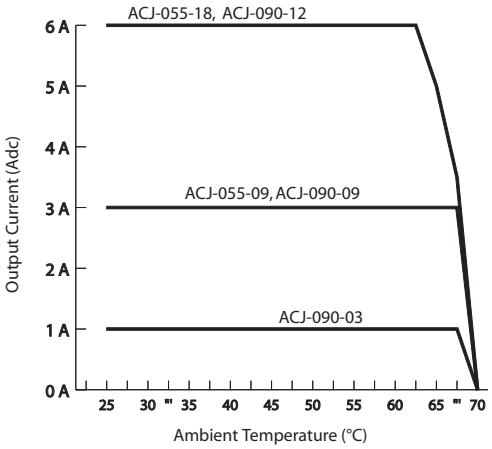
VERTICAL MOUNTING ON INFINITE HEATSINK



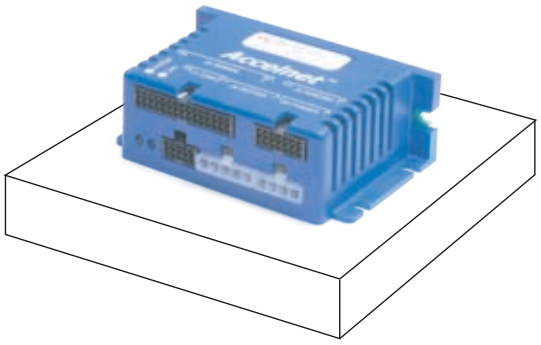


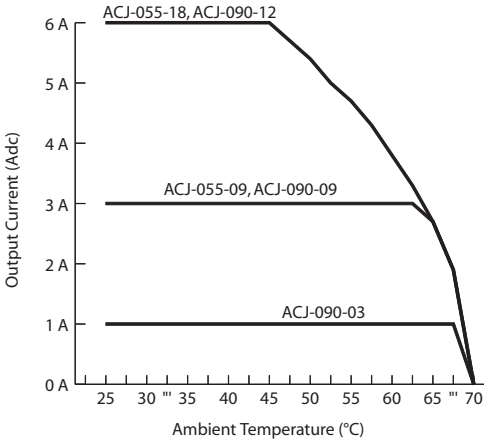
HORIZONTAL MOUNTING, FAN-COOLED, 400 LFM



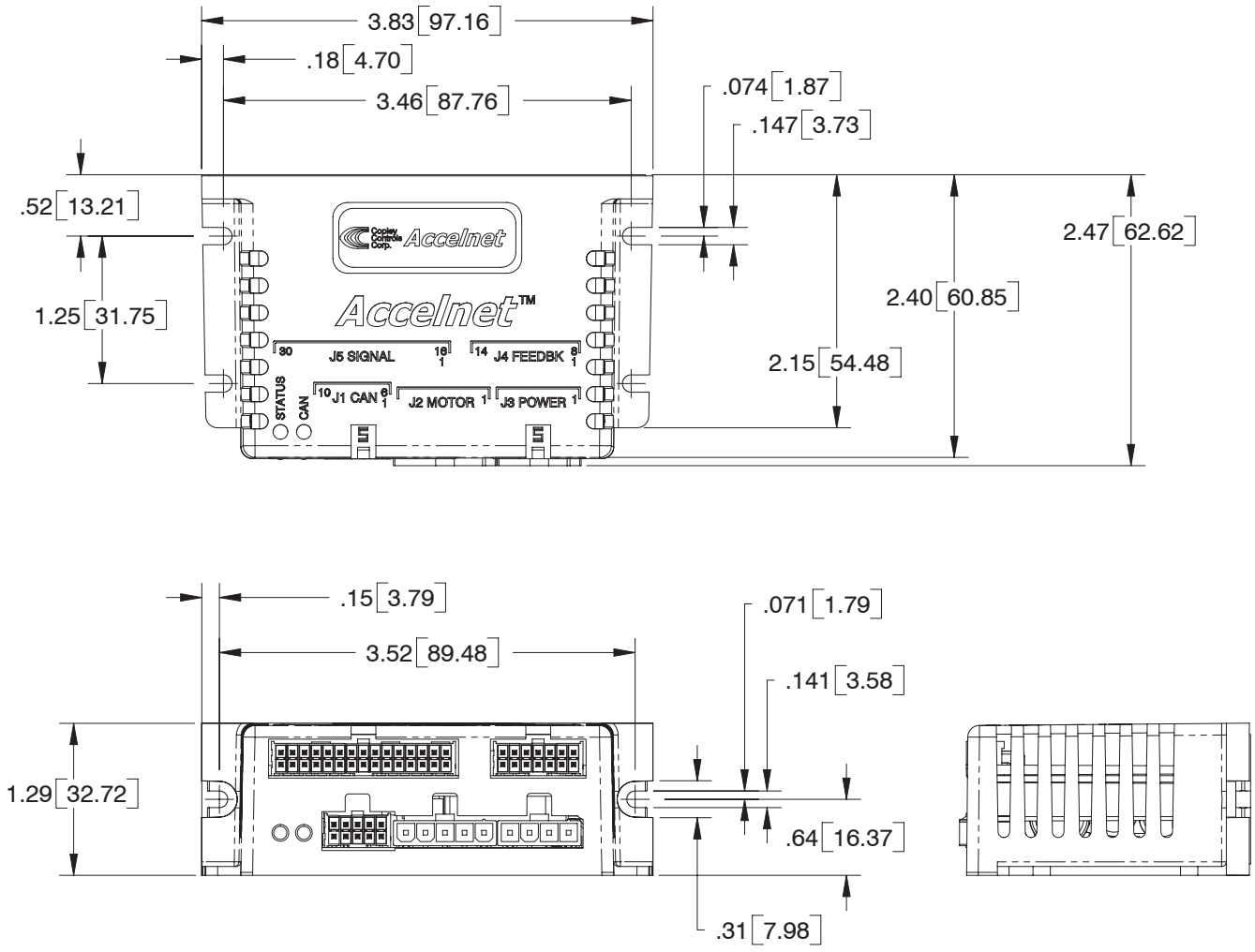


HORIZONTAL MOUNTING, CONVECTION COOLING





DIMENSIONS



Notes

1. Dimensions shown in inches[mm].
2. Weight: 4.8 oz (0.14 kg)
3. Recommended mounting hardware is pan-head SEMS screws with internal tooth lock washers, imperial size #4-40 or metric M3 thread.
4. For CE compliance heatplate must be grounded.

MASTER ORDERING GUIDE

AMPLIFIERS

ORDER NUMBER	DESCRIPTION
ACJ-055-09	*Accelnet Micro Panel* Servoamplifier 3/9 Adc @ 55 Vdc
ACJ-055-18	*Accelnet Micro Panel* Servoamplifier 6/18 Adc @ 55 Vdc
ACJ-090-03	*Accelnet Micro Panel* Servoamplifier 1/3 Adc @ 90 Vdc
ACJ-090-09	*Accelnet Micro Panel* Servoamplifier 3/9 Adc @ 90 Vdc
ACJ-090-12	*Accelnet Micro Panel* Servoamplifier 6/12 Adc @ 90 Vdc

ACCESSORIES

ORDER NUMBER	Qty	Ref	DESCRIPTION
ACJ-CK Connector kit with poke/crimp connectors (includes next 7 items shown below)			
	1	J1	Connector housing, CAN, 10 position (Samtec)
	1	J2	Connector housing, motor, 5 position (Molex Mini-Fit)
	1	J3	Connector housing, power, 4 position (Molex Mini-Fit)
	1	J4	Connector housing, feedback, 14 position (Samtec)
	1	J5	Connector housing, control, 30 position (Samtec)
	60	J1,J4,J5	Contact, crimp, female, for AWG 24~20 wire (Samtec)
	12	J2,J3	Contact, crimp, female, for AWG 24~20 wire (Molex Mini-Fit)
ACJ-NK Connector kit for CANopen networking (includes next 3 items shown below)			
ACJ-CV	1	J1	Cable adapter: Sub-D 9 position female to RJ-45 female
ACJ-NA-10	1	J1	CANopen cable assembly: RJ-45 plug to flying leads with crimps, 10 ft (3 m)
ACJ-NT	1	J1	CANopen terminator (J1 plug with resistor)
Individual Components			
ACJ-CV		J1	Cable adapter: Sub-D 9 position female to RJ-45 female
ACJ-FC-10		J4	Feedback cable assembly, 10 ft (3 m), with flying leads
ACJ-NA-10		J1	CANopen cable assembly: RJ-45 plug to flying leads with crimps, 10 ft (3 m)
ACJ-NC-10		J1	CANopen cable assembly: amplifier J1 plug to flying leads with crimps , 10 ft (3 m)
ACJ-NC-01		J1	CANopen cable assembly: amplifier J1 plug to flying leads with crimps , 1 ft (0.3 m)
ACJ-NT		J1	CANopen network teminator (J1 plug with resistor)
ACJ-SK		J5	Serial cable kit: Sub-D 9 position female to amplifier J5 connector, 6 ft (1.8 m)
CME2			CME 2™ CD (CME 2)

ORDER EXAMPLE: STAND-ALONE

Qty	Order No.	Description
1	ACJ-090-09	*Accelnet Micro Panel*
1	ACJ-CK	Connector Kit
1	ACJ-FC-10	Feedback Cable, 10 ft (3m)
1	ACJ-SK	Serial Cable Kit
1	CME2	CME 2 Program CD

ORDER EXAMPLE: CAN NETWORKING

Qty	Order No.	Description
1	ACJ-090-09	*Accelnet Micro Panel*
1	ACJ-CK	Connector Kit
1	ACJ-NK	Network Connector Kit
1	ACJ-SK	Serial Cable Kit
1	CME2	CME 2 Program CD

For each additional ACJ amplifier in a CAN network:

1	ACJ-NC-10	Amplifier J1 plug to flying leads, 10 ft (3 m)
	or	
1	ACJ-NC-01	Amplifier J1 plug to flying leads, 1 ft (0.3 m)

Note: Specifications subject to change without notice

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